

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
31 March 2005 (31.03.2005)

PCT

(10) International Publication Number  
**WO 2005/028695 A1**

(51) International Patent Classification<sup>7</sup>: **C23C 14/16**,  
14/02, 14/58, 10/02

PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,  
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,  
ZW.

(21) International Application Number:  
PCT/EP2004/010673

(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,  
SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

(22) International Filing Date:  
23 September 2004 (23.09.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
03447234.0 24 September 2003 (24.09.2003) EP

**Declaration under Rule 4.17:**

— as to the applicant's entitlement to claim the priority of the  
earlier application (Rule 4.17(iii)) for the following desig-  
nations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW,  
BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ,  
EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GR, HU, ID,  
IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU,  
LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ,  
OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY,  
TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM,  
ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA,  
SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ,  
BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE,  
BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE,  
IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent  
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE,  
SN, TD, TG)

(71) Applicant (for all designated States except US): USINOR  
S.A. [FR/FR]; Immeuble "La Pacific", 11/13 Cours Valmy  
- La Défense 7, F-92800 Puteaux (FR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): DE MEYER,  
Marijke [BE/BE]; Emeric De Bruynelaan 28, B-9940  
Evergem-Sleidinge (BE). CLAESSENS, Serge [BE/BE];  
Knyffstraat 45, B-2100 Deurne (BE). HÖRZEN-  
BERGER, Franz [AT/BE]; Zelzatestraat 26, B-9960  
Assenede (BE).

(74) Agents: VAN MALDEREN, Joëlle et al.; Office Van  
Malderen, Place Reine Fabiola 6/1, B-1083 Brussels (BE).

**Published:**

— with international search report  
— before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, GR, HU, ID, IL, IN, IS, JP, KE,  
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,  
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,

(54) Title: A METHOD AND APPARATUS FOR THE PRODUCTION OF METAL COATED STEEL PRODUCTS

(57) Abstract: The present invention is related to a method for the production of metal coated steel products, comprising the steps of: providing a steel product with a metal coating; adding an additional metallic element to said coating; subjecting said product to a thermal treatment, characterized in that: prior to the addition of said additional element, said product is subjected to a plasma treatment via a dielectric barrier discharge, for cleaning and activating the surface of said coating; said additional element is added through a physical vapour deposition technique; said thermal treatment is applied by directing high energy infra red radiation towards the outer surface of said coating. The present invention is further related to an apparatus comprising: a means for performing a plasma treatment on a metal coated product; a means for adding an additional element to said coating by using a physical vapour deposition technique; a means for directing high energy infra red radiation towards the outer surface of said coating.



WO 2005/028695 A1